

REMARKS

This response is intended as a full and complete response to the Office Action dated January 9, 2009, having a shortened statutory period for response set to expire on April 9, 2009. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1, 2, 4-13, 15, 16, 19-33 and 37-42 remain pending in the application and are shown above. Claims 1, 2, 4-13, 15, 16, 19-33 and 37-42 are rejected. Reconsideration of the rejected claims is requested for reasons presented below.

Claim Rejections – 35 U.S.C. § 103

Claims 28-31 are rejected under 35 U.S.C. §102(e) as being anticipated by United States Patent No. 6,299,515 to *Beardsley et al.* (hereinafter *Beardsley*) in view of United States Patent No. 5,888,121 to *Kirchner et al.* (hereinafter *Kirchner*). Applicant respectfully traverses the rejection.

The Examiner states that *Beardsley* does not specifically disclose the groove sloping so that the groove depth changes along a length of at least one non-intersecting fluid retaining groove. (See Office Action at 2.) The Examiner states that *Kirchner* discloses a CMP polishing apparatus in which grooves are sloped so that the depth changes along the length so as to change the volume of fluid contained therein. (See Office Action at 2.) The Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have made the platen of *Beardsley et al.*'s apparatus to have the depth change along the length so as to change the volume of fluid contained therein. (See Office Action at 2.)

Contrary to the Examiner's statement, *Kirchner* does not disclose "a CMP polishing apparatus in which grooves are sloped so that the depth changes along the length so as to change the volume of fluid contained therein." *Kirchner* teaches enhancement of slurry flow in slurry "starved" areas by increasing a cross-sectional area of grooves in those

areas. *Kirchner* at col. 4: lines 30-32. *Kirchner* teaches a first set of macrogrooves 108 in a center area 104 of a pad and a second set of macrogrooves 106 in a second area 102 outside the center area 104. *Kirchner* at col. 4: lines 56-60. *Kirchner* teaches that "macrogroove 108 may have the same width as macrogroove 106, however, macrogroove 108 may be deeper than macrogroove 106." *Kirchner* at col. 5: lines 24-26. Thus *Kirchner* teaches a first set of macrogrooves of one depth and a second set of macrogrooves of a different depth, however, *Kirchner* does not teach wherein at least one of the non-intersecting fluid retaining grooves is sloped so that a groove depth changes along a length of the at least one non-intersecting fluid retaining groove as recited in claim 28 and claims dependent thereon.

Therefore, *Beardsley* in view of *Kirchner* does not teach, show, suggest, or otherwise make obvious a rotatable platen for a polishing system, comprising a patterned pad mounting surface forming a plurality of non-intersecting fluid retaining grooves each having a portion oriented at an angle relative to a radial line originating at a center of the pad, the portion adapted to flow a fluid inwardly from a perimeter portion to a center portion of the platen during rotation of the platen, and wherein at least one of the non-intersecting fluid retaining grooves is sloped so that a groove depth changes along a length of the at least one non-intersecting fluid retaining groove, as recited in claim 28 and claims dependent thereon. Withdrawal of the rejection is respectfully requested.

Claims 1, 2, 4-7, 9-13, 15, 16, 19, 20, 26, 27, 32, 33 and 37-41 are rejected under 35 U.S.C. § 103(a) as being unpatentable over United States Patent No. 5,527,215 to *Rubino et al* (hereinafter *Rubino*) in view of *Kirchner*. Applicant respectfully traverses the rejection.

The Examiner states that *Rubino et al.* does not specifically disclose the grooves having varying slopes. (See Office Action at 3.) The Examiner states that *Kirchner* discloses a polishing pad having sloping grooves so as to enhance the flow of polishing fluid. (See Office Action at 3.) The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the pad of

Rubino to have sloped grooves as taught by *Kirchner* so as to change the volume of fluid contained therein. (See Office Action at 3.)

The deficiencies of *Kirchner* are discussed above. *Rubino* does nothing to cure these deficiencies.

Therefore, the combination of *Rubino* with *Kirchner* does teach, show, suggest, or otherwise make obvious an apparatus, comprising a semiconductor polishing device having a first surface defining at least two non-intersecting fluid retaining grooves at least a portion of which is oriented at an angle relative to a radial line originating at a center of the semiconductor polishing device, wherein the non-intersecting fluid retaining grooves are adapted to flow a fluid inwardly toward a center portion of the semiconductor polishing device, and wherein at least one of the non-intersecting fluid retaining grooves is sloped so that a groove depth changes along a length of the at least one non-intersecting fluid retaining groove, as recited in claim 1 and claims dependent thereon. Withdrawal of the rejection is respectfully requested.

Also, the combination of *Rubino* with *Kirchner* does not teach, show, suggest, or otherwise make obvious a substrate polishing pad, comprising: (a) a polishing surface on a first side of the substrate polishing pad, and (b) a mounting surface on a second side of the substrate polishing pad, wherein at least one of the polishing surface and the mounting surface has a plurality of non-intersecting fluid retaining grooves formed therein, wherein the grooves are disposed so that upon a given direction of movement of the substrate polishing pad a fluid disposed in the grooves is urged to flow from an outer portion toward a center portion of the substrate polishing pad, wherein the one or more fluid retaining grooves extend from the center portion of the substrate polishing pad to an edge of the substrate polishing pad, and wherein no point of the grooves is tangent to a radial line extending from a center to the substrate polishing pad, and wherein at least one of the non-intersecting fluid retaining grooves is sloped so that a groove depth changes along a length of the at least one non-intersecting fluid retaining groove, as recited in claim 15. Withdrawal of the rejection is respectfully requested.

Also, the combination of *Rubino* with *Kirchner* does not teach, show, suggest, or otherwise make obvious a substrate polishing pad, comprising: (a) a polishing surface on a first side of the substrate polishing pad, and (b) a mounting surface on a second side of the substrate polishing pad, wherein at least one of the polishing surface and the mounting surface has a plurality of non-intersecting fluid retaining grooves formed therein, wherein the grooves are disposed so that upon a given direction of movement of the substrate polishing pad a fluid disposed in the grooves is urged to flow from an outer portion toward a center portion of the substrate polishing pad, and wherein the grooves are formed on the mounting surface and the substrate polishing pad comprises perforations extending between the polishing surface and the mounting surface, and wherein at least one of the non-intersecting fluid retaining grooves is sloped so that a groove depth changes along a length of the at least one non-intersecting fluid retaining groove, as recited in claim 16. Withdrawal of the rejection is respectfully requested.

Also, the combination of *Rubino* with *Kirchner* does not teach, show, suggest, or otherwise make obvious an apparatus for polishing a substrate, comprising: (a) one or more rotatable platens, (b) a motor coupled to the rotatable platens, (c) one or more polishing heads rotatably mounted in facing relation to the rotatable platens, and (d) a polishing pad disposed on each of the rotatable platens, wherein at least one of the rotatable platens and the polishing pads comprise a plurality of non-intersecting fluid retaining grooves formed on a first surface thereof and wherein at least a portion of the grooves are disposed at an angle to a radial line extending from a center of the first surface and are adapted to flow a fluid inwardly from an outer portion to a center portion of the first surface, and wherein at least one of the non-intersecting fluid retaining grooves is sloped so that a groove depth changes along a length of the at least one non-intersecting fluid retaining groove, as recited in claim 19 and claims dependent thereon. Withdrawal of the rejection is respectfully requested.

Also, the combination of *Rubino* with *Kirchner* does not teach, show, suggest, or otherwise make obvious an apparatus, comprising a semiconductor polishing device having a first surface defining at least one non-intersecting fluid retaining groove at least a

portion of which is oriented at an angle relative to a radial line originating at a center of the semiconductor polishing device, and wherein the non-intersecting fluid retaining groove has a first portion and a second portion having a same direction of curvature and defining a tangent point to the radial line and wherein the non-intersecting fluid retaining groove is adapted to flow a fluid inwardly toward a center portion of the semiconductor polishing device, and wherein the non-intersecting fluid retaining groove is sloped so that a groove depth changes along a length of the non-intersecting fluid retaining groove, as recited in claim 32 and claims dependent thereon. Withdrawal of the rejection is respectfully requested.

Also, the combination of *Rubino* with *Kirchner* does not teach, show, suggest, or otherwise make obvious an apparatus for polishing a substrate, comprising: (a) a rotatable platen, (b) a motor coupled to the rotatable platen, (c) a polishing head rotatably mounted in facing relation to the rotatable platen, and (d) a polishing pad disposed on the rotatable platen, wherein a plurality of non-intersecting slurry retaining grooves are formed at an interface between the polishing pad and the rotatable platen and wherein a first portion of the grooves are oriented to flow slurry inwardly from an outer region to an interior region at the interface between the polishing pad and the respective rotatable platens for a given direction of rotation of the platen, and wherein a second portion of the grooves are oriented to flow slurry outwardly from a central region to the interior region at the interface between the polishing pad and the rotatable platen for the given direction of rotation of the platen, and wherein at least one of the non-intersecting fluid retaining grooves is sloped so that a groove depth changes along a length of the at least one non-intersecting fluid retaining groove, as recited in claim 37. Withdrawal of the rejection is respectfully requested.

Also, the combination of *Rubino* with *Kirchner* does not teach, show, suggest, or otherwise make obvious an apparatus, comprising a semiconductor polishing device having a first surface defining at least two fluid retaining grooves at least a portion of which is oriented at an angle relative to a radial line originating at a center of the semiconductor polishing device, wherein the fluid retaining grooves are adapted to flow a fluid inwardly toward a center portion of the semiconductor polishing device, and wherein at least one of

the fluid retaining grooves is sloped so that a groove depth changes along a length of the at least one fluid retaining groove as recited in claim 38 and claims dependent thereon. Withdrawal of the rejection is respectfully requested.

Claims 23 and 24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Rubino* in view of *Beardsley*. Applicant respectfully traverses the rejection.

The Examiner states that *Rubino* does not disclose a platen containing non-intersecting fluid retaining grooves. (See Office Action at 3.) The Examiner states that *Beardsley* discloses a CMP apparatus comprising a rotating platen that contains recesses that distribute the slurry, which provide for a uniformly planarized workpiece and also creates a system which also removes slurry for disposal or reuse. (See Office Action at 3.) The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the platen of *Rubino* to include grooves as taught by *Beardsley* so as to distribute the slurry along prescribed paths assuring more even distribution of the slurry and creating a system for removing the slurry for reuse or disposal. (See Office Action at 3.)

Beardsley does not teach, show, suggest, or otherwise make obvious grooves which are sloped or tapered so that the groove depth changes along a length of the fluid retaining groove to facilitate slurry delivery control to a particular area of the polishing pad. Thus *Beardsley* does not remedy the deficiencies of *Rubino* in view of *Kirchner* for claim 19. Therefore, *Rubino* in combination with *Beardsley* does not teach, show, suggest, or otherwise make obvious the rejection matter of claim 19 and claims 23 and 24 dependent thereon. Withdrawal of the rejection is respectfully requested.

Claims 21, 22, 25 and 29 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Beardsley* in view of United States Patent No. 6,332,830 to *Okamura et al.* Applicant respectfully traverses the rejection.

The Examiner states that *Beardsley* does not disclose a polishing pad with linear grooves. (See Office Action at 4.) The Examiner states that *Okamura* discloses an

apparatus for chemical mechanical polishing using polishing pads containing linear grooves to provide for a more even distribution of pressure on the workpiece thus producing a better quality finish. (See Office Action at 4.) The Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the platen of *Beardsley et al.* to include the linear grooves taught by *Okamura et al.* so as to allow for distribution of the slurry and the pressure transmitted to the workpiece. (See Office Action at 4.)

Okamura fails to remedy the deficiencies of *Rubino* or *Beardsley* in view of *Kirchner* for claims 19 and 28. Therefore, *Okamura* in combination with *Beardsley*, *Rubino*, and *Kirchner* does not teach, show, suggest, or otherwise make obvious the rejection matter of claims 19 and 28 and claims 21, 22, 25 and 29 dependent thereon.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

The secondary references made of record are noted. However, it is believed that the secondary references are no more pertinent to the Applicant's disclosure than the primary references cited in the office action. Therefore, Applicant believes that a detailed discussion of the secondary references is not necessary for a full and complete response to this Office Action.

Respectfully submitted,

By 

Keith M. Tackett
Registration No.: 32,008
PATTERSON & SHERIDAN, LLP
3040 Post Oak Blvd, Suite 1500
Houston, Texas 77056
Telephone: (713) 623-4844
Facsimile: (713) 623-4846
Attorney For Applicant